

## Rapid coupling

### Description

#### Prior Art

A rapid coupling having the features specified in the preamble of claim 1 is disclosed in EP 0 467 381 A1. There, an engagement section is provided on the pipe nipple on the form of an annular bead or groove which cooperates with a resilient locking element disposed inside the bush in such a way that the pipe nipple is retained in the bush by engagement between the locking element and the engagement section.

When the pipe nipple is pushed into the bush, latching takes place between the locking element and the engagement which is as such audible and tangible. However, if mounting is done automatically or under unfavourable working conditions, audible or tangible latching as an indicator of a complete locking has to be ruled out. Also in a subsequent inspection, the locking state can only be checked by trying to pull the pipe nipple out of the bush, which is labour-intensive and is not readily possible in the case of fully assembled machines.

#### Summary of the Invention

A general object of the invention is to overcome, at least in part, disadvantages as occur in comparable rapid couplings of the prior art. A more specific object of the invention may be seen in providing a rapid coupling in which the locking state between the pipe nipple and the bush can easily be ascertained.

This object is met by the rapid coupling defined in claim 1. In the arrangement of claim 1, the engagement section (groove or projection) is outside the bush and is thus visible when the pipe nipple and the bush are not properly coupled and thus not locked. Thus, the engagement section, in addition to its actual latching function with the locking element, assumes the additional task as an indicator of the locking state of the rapid coupling.

The development of claim 2 is particularly advantageous in that the compression spring again serves a double purpose, namely to bias the engagement between the locking element of the bush and the engagement section of the pipe nipple toward a defined position, on the one hand, and to ensure that the pipe nipple is pushed out of the bush in the unlocked state, so that the engagement section reliably fulfils the said indicator function, on the other hand.

Claims 3 to 5, and claims 6 and 7 relate to expedient embodiments of the locking mechanism, which are uncomplicated in production, ensure reliable locking and yet allow simple uncoupling.

### Brief Description of the Drawing

Embodiments of the invention are explained in more detail below with reference to the drawing, in which:

Fig. 1 shows a rapid coupling, partly in axial section, in the coupled and locked state;

Fig. 2 is an enlarged detailed view of the locking region of the rapid coupling according to Fig. 1;

Fig. 3 shows the same coupling in the pushed-together, but not yet locked state; and

Fig. 4 is an illustration similar to Fig. 1 of a rapid coupling with a locking arrangement of different design.

### Detailed Description of Embodiments

The rapid coupling shown in Fig. 1 comprises a bush **10** having a through-hole **11** and a pipe nipple **12** which can be inserted into said bush **10** and is to be coupled to the bush. The bush **10** is provided, at its end remote from the insertion end **13** for the pipe nipple **12**, with an external thread **14** for screwing into a machine housing, for example a motor-vehicle engine block and, on a further part of its outer surface, with a hexagon **15**. Instead of a screw connection, the bush **10** may be formed as an insert part to be inserted into a corresponding hole of the machine housing and fastened therein by material displacement, as described in EP 0 467 381 A1.

The pipe nipple **12** is of cylindrical shape over its length to be inserted into the bush **10** and, in the embodiment of Figs. 1 to 3, has an annular recess or groove **17** at some distance from its insertion end **16**. In the embodiment shown, the pipe nipple **12** is curved outside the bush **10**.

A helical compression spring **19** is disposed between the insertion end **16** of the pipe nipple **12** and an annular stop **18** formed in the interior of the through-hole **11** of the bush **10**, the outer diameter of the compression spring **19**, in the compressed state, being approximately equal to the inner diameter of the through-hole **11**. In the embodiment shown, the stop **18** is located at the end of the bush **10** remote from the insertion end **13**.

Furthermore, the bush **10**, in the region where the cylindrical section **20** between the insertion end **16** and the groove **17** of the pipe nipple **12** is located in the coupled state, has an annular recess **21** into which a sealing O-ring **22** is inserted.

Serving to lock the pipe nipple **12** in the bush **10** in the coupling state shown in Figs. 1 and 2, is a locking ring **23** which is resilient in the radial direction, is split in the circumferential direction, and is dimensioned in such a way that its inner diameter in the released state is smaller than the outer diameter of the pipe

nipple 12. The locking ring 23 is located in an annular recess 24 which is formed in the bush 10 close to its insertion end and has three successive regions 25...27 of different diameters.

The inner region 25 has an inner diameter which is slightly larger than the diameter of the pipe nipple 12 plus twice the radial thickness of the locking ring 23. The inner diameter of the centre region 26 of the annular recess 24 corresponds to the outer diameter of the groove 17 provided in the pipe nipple 12 plus twice the radial thickness of the locking ring 23. The inner diameter of the outer region 27 of the annular recess 24 is smaller than that of the centre region 26.

If the pipe nipple 12 is pushed sufficiently far with its end section 20 into the through-hole 11 of the bush 10, the groove 17 formed in the pipe nipple 12 passes into the region of the annular recess 24 provided in the bush 10, and the locking ring 23 enters the groove 17 in which it latches in place due to its bias.

When the pipe nipple 12 is released, the compression spring 19, which is compressed when said pipe nipple 12 is being pushed in, seeks to push the pipe nipple 12 outward, the locking ring 23 being urged into the centre region 26 of the annular recess 24 until it abuts against the step between the centre region 26 and the outer region 27 of the annular recess 24 in the position shown in Fig. 2. This is the fully coupled and locked position, in which the groove 17 of the pipe nipple is located completely within the bush 10.

An unlocking tool consisting of two tubular halves, which may have the form shown in Fig. 12 of EP 0 467 381 A1 and is not shown here, may be used for releasing the coupling. The two tubular halves of this tool are so dimensioned that they can be passed through the gap between the outer region 27 of the annular recess 24 and the outside of the pipe nipple 12. If the pipe nipple 12 is then pushed inward against the force of the compression spring 19 until the locking ring 23 faces the wider, inner region 25 of the annular recess 24, the locking ring 23 can be lifted out of the groove 17 of the pipe nipple by means of the tool, whereupon the pipe nipple 12 can be pulled out of the through-hole 11 of the bush 10.

As shown in Fig. 1 of EP 0 467 381 A1, the unlocking tool may have the form of a sleeve movable on the pipe nipple and having a wall thickness corresponding to the gap between the outer region 27 of the annular recess 24 and the outside of the pipe nipple 12. In order not to damage the coupling, such a sleeve is preferably made of plastic.

In the state shown in Fig. 3, the end section 20 of the pipe nipple 12 still engages in the bush 10, and the O-ring 22 may bear against the end section 20 and effect a seal. In this state, however, the coupling is not locked, so that an unintentional relative movement between the bush 10 and the pipe nipple 12 may

lead to leakage or even to complete release of the coupling. This non-locked condition can be readily recognised visually, with the naked eye or by means of an imaging device, because the groove 17 of the pipe nipple 12 is visible outside the bush 10.

5 In the second embodiment shown in Fig. 4, the pipe nipple 12, instead of having the groove, has a projection 28 which can be formed, for example, as an annular bead by axial upsetting of the pipe nipple. In this case, the annular recess 34 provided in the bush 10 has two regions 35, 37, the inner diameter of the inner region 35 being slightly larger than the outer diameter of the annular bead 28 plus twice the radial thickness of the locking ring 23. The inner diameter of the outer region 37 of the annular recess 34 corresponds to the outer diameter of the bead 28; to be precise, it is only slightly larger than the latter, so that the pipe nipple 12 can easily be inserted. The outer region 37 and the outer surface of the pipe nipple 12 form a gap for inserting the above mentioned unlocking tool.

10 15 When the end section 20 of the pipe nipple 12 is pushed in against the force of the compression spring 19, the locking ring 23 held in place by the inner end face of the annular-recess region 35 is lifted over the annular bead 28. When the pipe nipple 12 is released, the compression spring 19 causes the locking ring 23 to be pressed against the opposite end face of the annular-recess region 35 by 20 the bead 28 and the locking is effected.

25 If the pipe nipple 12 is not inserted sufficiently far into the bush so that no locking is not achieved, the compression spring 19 pushes the pipe nipple 12 out of the bush 10 to such an extent that the annular bead 28 remains visible outside the bush.

30 Since the annular locking recess 24 or 34 in both embodiments is located in direct proximity to the insertion end 13 of the bush 10, the groove 17 or bead 28 is visible outside the bush 10 if no latching is effected. The groove 17 or bead 28 may be located, however, close to the insertion end 13 of the bush 10.

The compression spring 19, which defines the latched locking position shown in Figs. 1, 2 and 4, is so dimensioned that, in the unlocked state, it pushes the pipe nipple 12 out of the bush 10 to such an extent that the groove 17 or bead 28 is located at some distance from the insertion end 13 of the bush 10 and is therefore in any case clearly visible.

**List of Reference Numbers**

<b>10</b>	Bush
<b>11</b>	Through-hole
<b>12</b>	Pipe nipple
<b>13</b>	Insertion end of the bush <b>10</b>
<b>14</b>	External thread
<b>15</b>	Hexagon
<b>16</b>	Insertion end of the pipe nipple <b>12</b>
<b>17</b>	Groove in the pipe nipple <b>12</b>
<b>18</b>	Stop
<b>19</b>	Compression spring
<b>20</b>	End section
<b>21</b>	Annular recess for O-ring <b>22</b>
<b>22</b>	O-ring
<b>23</b>	Locking ring
<b>24</b>	Annular recess in the bush <b>10</b>
<b>25</b>	Inner region of the annular recess <b>24</b>
<b>26</b>	Centre region of the annular recess <b>24</b>
<b>27</b>	Outer region of the annular recess <b>24</b>
<b>28</b>	Annular bead
<b>34</b>	Annular recess in the bush <b>10</b>
<b>35</b>	Inner region of the annular recess <b>34</b>
<b>37</b>	Outer region of the annular recess <b>34</b>